REMARKS

This amendment is in response to the Office Action mailed on September 29, 2004. In the Office Action, claims 1-57 were pending. All pending claims were rejected.

On page 2, the Office Action states that the Information Disclosure Statement fails to comply with 37 CFR 1.98(a)(2) in that copies of references cited in the Information Disclosure Statement were missing. Applicants have enclosed a copy of a postcard indicating receipt of the Information Disclosure Statement and all 17 of the cited references. Applicants respectfully submit that copies of all references cited in the Information Disclosure Statement were sent. Nonetheless, Applicants have enclosed additional copies of the references that were indicated as being missing along with a new 1449 form. Applicants do not believe any fee is required for consideration of these references since Applicants initially provided the references before the first Office Action issued.

On page 2, the Office Action indicates that claims 3 and 15-24 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for having insufficient antecedent basis for a limitation in the claims. Applicants have amended claims 3 and 15 to correct the antecedent basis problems and respectfully submit that claims 3 and 15-24 are now definite. In addition, Applicants note that claims 21 and 31 have been amended to correct typographical errors.

Next, on page 3, the Office Action states that claims 1-6, 14, 25-27, 29 and 30 are rejected under 35 U.S.C. § 102(b) as being anticipated by Erell et al. (U.S. Patent No. 5,148,489). Claim 1 of the present application recites a method of identifying a clean signal feature vector from a noisy signal feature vector comprising "generating at least two mixture components for a prior probability describing combinations of clean signal feature vectors with obscuring feature vectors", and

using each mixture component to identify the clean signal feature vector.

Applicants submit that Erell does not teach generating "mixture components for a prior probability describing combinations of clean signal feature vectors with obscuring feature vectors." In the Office Action, Col. 5, lines 35-67 were cited as showing such mixture components. However, the cited section does not show mixture components of a prior probability that describe a combination of a clean signal feature vector with an obscuring feature vector. Instead, the only mixture component Erell shows is for a prior probability of a clean speech vector, P(S). It is not for a prior probability that is a combination of a clean speech vector with an obscuring feature vector. Erell does not use combinations of clean signal feature vectors with obscuring feature vectors. Probability "P(S)" is simply the probability of clean speech, and thus does not encompass obscuring feature vectors.

Claim 25 of the present invention recites a method of identifying a clean signal feature vector comprising "identifying a mixture of distributions that provide prior probabilities for combinations of clean signal feature vectors and obscuring feature vectors." As noted above, Erell does not use a mixture of distributions that provide prior probabilities for combinations of clean signal feature vectors and obscuring feature vectors. In particular, as mentioned above, Erell utilizes a prior probability of clean speech which does not encompass obscuring feature vectors.

Since Erell does not show mixtures of prior probabilities for combinations of clean signal feature vectors and obscuring feature vectors, Applicants respectfully submit that independent claims 1 and 25 are not taught by Erell and are in allowable form. Applicants further submit that dependent

claims 2-6, 14, 26, 27, 29, and 30 are also in allowable form at least based on their dependency to either claim 1 or claim 25.

On page 6, the Office Action indicates that claims 41 and 43-48 are rejected under 35 U.S.C. § 102(b) as being anticipated by Yamaguchi et al. (U.S. Patent No. 6,026,359, "Yamaguchi"). Independent claim 41 recites the limitation of "determining a revised value for a component of a clean signal feature vector based in part on the initial value for the component, the distribution of the training feature vectors, and the noisy signal feature vector", and "using the final value for the component to identify the clean signal feature vector."

Applicants note that Yamaguchi does not determine a revised value for a clean signal feature vector. Rather, Yamaguchi utilizes a Hidden Markov Model (HMM) for an initial model for noise and a noisy input feature vector to modify a HMM for noisy speech. After noise is extracted from a noisy speech input, it is applied to the HMM for noise. The difference between the extracted noise and the HMM model is utilized to adjust the HMM of noisy speech. Recognition is then performed by applying the noisy input feature vector against the revised HMM of noisy speech. Yamaguchi does not identify a revised clean signal feature vector. Simply put, Yamaguchi utilizes an adjusted noisy speech model rather than determining a revised clean signal feature vector as recited in claim 41. For at least these reasons, Applicants respectfully submit that claim 41 is not taught by Yamaguchi and is in allowable form. In addition, Applicants submit that claims 43-48, which depend either directly or ultimately from claim 41, are also in allowable form at least based on there relationship to claim 41.

On page 10, the Office Action states that claims 12, 15-17, 20-22, 24, 32-36, and 40 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Erell et al.

Claim 12, which depends from claim 1, is patentable over Erell for the reasons discussed above for claim 1. In particular, since Erell does not show or suggest a mixture of prior probabilities for a combination of clean signal feature vectors and obscuring signal feature vectors, it does not render claim 1 obvious. Viewing Erell, those skilled in the art would not be motivated to form mixtures of prior probabilities for combinations of clean signal feature vectors and obscuring signal feature vectors. As such, claim 1 and claim 12 are not obvious from Erell.

With regard to independent claim 15, the steps recited comprise determining an intersection of at least two distributions of obscuring feature vectors with at least one distribution of model clean signal feature vectors. The intersection is used to identify mixture components for a probability distribution that describes the prior probability of combinations of obscuring feature vectors and clean signal feature vectors.

Applicants respectfully submit that Erell simply does not teach or suggest determining the intersections of distributions of obscuring feature vectors with distributions of clean signal feature vectors. In the Office Action, Erell's reference to "overlapping regions of the acoustic space" was cited as showing the intersections of distributions of obscuring feature vectors with distributions of clean signal feature vectors. However, in the cited section, Erell is only discussing clean speech vectors. As such, the "overlapping regions of the acoustic space" are overlapping regions of clean speech. Thus, clean speech in one class may overlap clean speech of another class under Erell. Erell makes no mention of an intersection between distributions of obscuring feature vectors and distributions of clean speech feature vectors.

Similarly as mentioned above for claim 1, Erell does not teach or suggest obtaining mixture components for a prior probability of combinations of obscuring feature vectors and clean signal feature vector. The mixture components disclosed by Erell are associated only with clean speech. As such, claim 15 and claims 16-24, which depend therefrom, are patentable over Erell alone.

With regard to independent claim 32, Applicants have amended said claim to include the limitations previously contained in claim 34. Claim 34 has subsequently been cancelled. Applicants respectfully submit that Erell does not teach or suggest applying feature vectors to a function to produce a calculated noisy signal feature vector or comparing a calculated noisy signal feature vector to an observed noisy signal feature vector. In the Office Action, Erell's reference to the DFT for the noise was cited as showing applying feature vectors to a function to produce calculated noisy signal feature vectors. However, the DFT taken by Erell is of time values in a frame of noise. As such, the DFT is not being applied to feature vectors but instead is being applied to digital samples of a noise signal. In addition, the calculation of the variance in Erell does not involve comparing to feature vectors as in claim 32. Instead, the variance is assumed to be equal to the expected energy level of the noise divided by two times the number of DFT coefficients. There is no comparison of two feature vectors to produce the variance. As a result, Erell does not teach or suggest the computer-readable medium of claim 32, or claims 33, 35, 36 and 40, which depend therefrom.

On page 8, claims 7-11, 13, 18, 19, 23, 28, 31, and 37-39 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Erell in view of Eberman et al. (U.S. Patent No. 5,924,065, "Eberman").

Claims 7-11 and 13 depend from claim 1 and thus include the limitation to at least two mixture components for a prior probability describing combinations of clean signal feature vectors with obscuring feature vectors. As noted above, Erell does not show or suggest this limitation. Eberman also fails to show this limitation. As such, the combination of Erell and Eberman does not show at least two mixture components for a prior probability describing combinations of clean signal feature vectors with obscuring feature vectors. Therefore, at least for this reason, claims 7-11 and 13 are patentable over the cited art.

Claims 18, 19 and 23 depend ultimately from claim 15 and thus include the limitation to identifying at least two mixture components for a probability distribution that describes the prior probability of combinations of obscuring feature vectors and clean signal feature vectors. As noted above, Erell does not show this limitation. Eberman also fails to show this limitation. As such, the combination of Erell and Eberman does not show or suggest the invention of claims 18, 19 and 23. For at least this reason, claims 18, 19, and 23 are patentable over Erell and Eberman.

Claims 28 and 31 ultimately depend from claim 25 and as such include a limitation to identifying a mixture of distributions that provide prior probabilities for combinations of clean signal feature vectors and obscuring feature vectors. As noted above, Erell does not show or suggest such a mixture of such distributions. Similarly, Eberman fails to show or suggest this limitation. As such, claims 28 and 31 are patentable over the combination of Erell and Eberman.

Claims 37-39 ultimately depend from claim 32, which Applicants submit, for the reasons mentioned above, is neither taught nor suggested by Erell. Specifically, Erell does not show or suggest producing a variance by comparing a calculated noisy

signal feature vector to an observed noisy signal feature vector. Eberman also fails to show this limitation. As such, for at least this reasons, Applicants respectfully submit that claims 37-39 are allowable over the cited art.

On page 14 of the Office Action, claims 42 and 49-57 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamaguchi in view of Ramaswamy et al. (U.S. Patent No. 6,188,976, "Ramaswamy").

Claim 42 depends on independent claim 41, which Applicant submits, as mentioned above, is not taught by Yamaguchi. In particular, Yamaguchi does not show a step of determining a revised value for a clean signal feature vector as found in claim 41 and thus in claim 42. Similarly, Ramaswamy does not show or suggest determining a revised value for a clean signal feature vector. As such, this limitation is not shown in the combination of Yamaguchi and Ramaswamy. Therefore, claim 42 is patentable over the cited art.

With regard to independent claim 49, the steps recited include performing iterations to identify a final value for the clean signal feature vector where each iteration involves updating the clean signal feature vector. As mentioned above, Yamaguchi utilizes HMMs to update a model of noisy speech which is fundamentally different than the present application. Applicants submit that Yamaguchi does not revise or update clean speech vectors. Instead, it modifies Hidden Markov Models of noisy speech. Ramaswamy also does not show or suggest iteratively updating a clean signal feature vector. As such, the combination of Yamaguchi and Ramaswamy does not show this limitation. Therefore, Applicants respectfully submit that claim 49 is patentable over the combination of Yamaguchi and Ramaswamy. Applicants further submit that claims 50-57 are also allowable at least based on their dependency to claim 49.

In conclusion, Applicants submit that independent claims 1, 15, 25, 32, 41, and 49, and the claims that depend therefrom, are in allowable form. Reconsideration and allowance of claims 1-33 and 35-57 are respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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